2.15

Protection from Natural Hazards (WAC 463-42-265)

WAC 463-42-265 PROPOSAL — PROTECTION FROM NATURAL HAZARDS.

The applicant shall describe the means employed for protection of the facility from earthquakes, volcanic eruption, flood, tsunami, storms, avalanche or landslides, and other major natural disruptive occurrences.

[Statutory Authority: RCW 80.50.040(1) and chapter 80.50 RCW. 81-21-006 (Order 81-5), §463-42-265, filed 10/8/81. Formerly WAC 463-42-290.]

2.15 PROTECTION FROM NATURAL HAZARDS (WAC 463-42-265)

The following section describes natural hazards that may impact the proposed project and briefly describes environmental design measures included in the project to mitigate these potential impacts.

2.15.1 EARTHQUAKE HAZARDS

Earthquake-related damage to industrial facilities such as the planned Phase II facility typically arises from surface fault rupture, ground motion, or liquefaction of soils. See Section 3.1 - Earth, WAC 463-42-302, for additional details. The potential for seismically induced slope failure is addressed in Section 2.15.5.

2.15.1.1 Surface Fault Rupture

Surface fault rupture is highly unlikely at the plant site because of the absence of known faults beneath the site and the absence of evidence of faults with historical or geologically recent surface rupture in the site area. No surface fault rupture has been recorded in Washington within historic time (McCrumb et al. 1989). In general, faults that have had a surface rupture during the Holocene epoch (last 10,000 years) or multiple ruptures during the Pleistocene epoch of the Quaternary period (last 10,000 to 1.8 million years) are considered to have a potential for future surface rupture. The few known faults with Holocene or late Pleistocene surface displacement within the region are distant from the site (see Section 3.1 – Earth, WAC 463-42-302). No Quaternary faults have been previously mapped or inferred within the project boundaries (WPPSS 1988; Noson et al. 1988; and Rogers et al. 1996).

2.15.1.2 Strong Ground Motion

Western Washington, where the proposed plant is located, is characterized as a region of high seismic hazard due to the potential for strong earthquake ground motion (see Section 3.1.2.1). The site is in seismic Zone 3 of the 1997 Uniform Building Code (UBC). The UBC designates a total of six different seismic zones in the United States (i.e., Zones 0, 1, 2a, 2b, 3, and 4). The location of the boundaries of the zones are based on scientific studies of the intensity of ground motion (i.e., ground acceleration levels), the damage patterns produced in past earthquakes, and the locations of the fault zones where these earthquakes have occurred. Zone 0 represents areas with the lowest seismic activity and the least expected damage, and Zone 4 represents areas with highest seismic activity and the greatest expected damage.

The largest rational and believable seismic event that appears capable of occurring in the region within the current geologic epic, also known as maximum credible earthquake (MCE), is in the range of magnitude (M) 8.0 to 9.5 (Heaton and Hartzell, 1986). According to the probabilistic National Seismic Hazard Maps published by the USGS (Frankel, et al., 1996), the estimated peak ground acceleration (g) for the site is on the order of 0.25 to 0.30 g for a 2,475-year return period earthquake (10 percent chance of not being exceeded in 50 years). For a 2475-year return period earthquake (2 percent of not being exceeded in 50 years), the estimated peak acceleration for the site is 0.55 to 0.60 g. Design of facilities for the USGS estimated levels of ground shaking, and potentially higher levels, can be accommodated within the current level of seismic engineering design practice. As with Phase I, Phase II will be designed in accordance with the seismic design requirements for UBC Zone 3.

2.15.1.3 Liquefaction

Liquefaction is a phenomenon in which loose to medium-dense, saturated sands lose their shear strength during dynamic loading (usually during an earthquake) and behave as a fluid. Liquefaction induces soil settlements, loss of foundation support, and sometimes, lateral spreading or flow failure of a soil mass. These movements can have significant adverse effects on facilities built on or near areas experiencing liquefaction. Due to the depth of groundwater and the lack of loose soils in the shallow subsurface, the soils of the power plant site do not appear to be susceptible to liquefaction. Therefore, plant design does not include measures to protect the plant from the adverse effects of liquefaction.

2.15.2 FLOOD

The plant site is over 300 feet above the flood plain of the Chehalis River and thus will not require dikes or other flood protection devices other than the normal storm water control system.

2.15.2.1 Flood Hazards

Please see Subsection 2.15Flood hazards were delineated for the plant site area according to the Federal Emergency Management Agency's (FEMA) flood insurance rate maps. The site is outside of any flood zone listed on the FEMA maps.

Flood potential at the Satsop CT project site was estimated and presented in the Final Safety Analysis Report (FSAR) for the WPPSS's nuclear plant WNP-3 (WPPSS 1988a). The FSAR analysis utilized historical flood data to estimate probable maximum floods on streams and rivers in the site vicinity using the HEC-1 Flood Hydrography Package developed by the U.S. Army Corp of Engineers. The probable maximum flood (PMF) was computed to be 53.1 feet mean sea level (MSL). The elevation of the plant site ranges from about 290 to 315 feet MSL and therefore the plant site is not within the flood hazard area.

The FSAR provided additional analysis on water levels at the site assuming coincident wind wave activity, seismically induced dam failure in a nearby dam, and tsunami flooding. Conclusions indicated the PMF resultant from coincident wind wave activity is 76.2 feet MSL and water elevation from seismically induced dam failure is 39.6 feet MSL. Both levels are below the elevation of the plant site. The rise in water level as a result of a tsunami occurring and entering into Grays Harbor at the mouth of the Chehalis River is estimated to be 3.5 feet. This rise would only produce a negligible rise in the river's water level and would not affect the plant site.

2.15.3 TSUNAMIS

The plant site is approximately 20 miles from the coast at an elevation of approximately 290 to 315 feet above sea level. As a result, tsunamis are not a potential hazard at the site.

2.15.4 STORMS

The plant will be constructed in accordance with current building codes and designed to withstand wind and rain conditions associated with a 100-year storm event. Erosion and sedimentation control measures will be incorporated in all stages of construction and operation, and will also be designed, when appropriate, for the 100-year event. In the Satsop area, cumulative precipitation amounts for a 24-hour period of the 100-year storm event would be between 0.65 and 0.7 inches (Miller, et al. 1973).

2.15.5 AVALANCHES OR LANDSLIDES

The power plant site is generally flat, with about 25 feet of elevation change across the site. The areas adjacent to and near the site are also relatively flat, and avalanches and landslides (including seismically induced slope failures) are not considered to be a potential hazard at power plant site. The nearest identified landslide deposits to the site are two 1-acre failures located in Helm Creek glacial deposits on Fuller Creek, approximately 1,500 feet southeast of the site. None of the identified slope failures were judged to be recent. New slides or reactivation of old landslides in these areas would not affect the proposed power plant.

2.15.6 VOLCANOES

The power plant site is approximately 80 miles from both Mt. St. Helens and Mt. Rainier (Figure 2.15-1). Both volcanoes have erupted within the historic record, with Mt. St. Helens most recently erupting in 1980 (Harris 1980). Based on the effects of past eruptions both observed and in the geologic record, an eruption of either volcano would not directly affect the power plant and there is a low potential for deposition of significant air fall at the site (Waldron 1989). However, it is possible that a shift in the prevailing wind direction could cause airborne ash to reach the site and require a temporary shut down of the combustion turbines. No additional mitigation efforts are anticipated for the plant from these causes.

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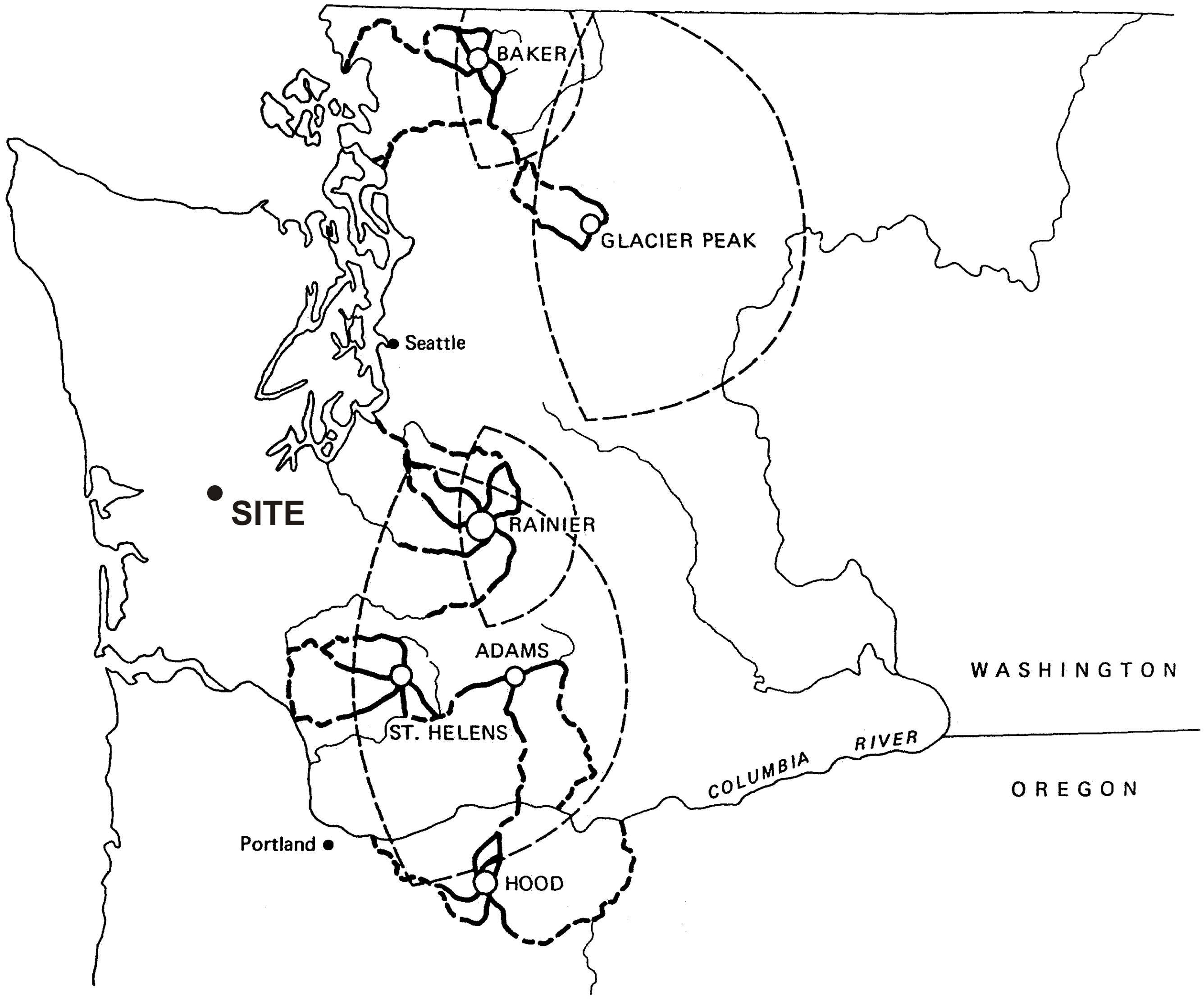
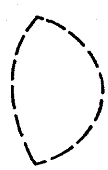


MAP EXPLANATION

LARGE VOLCANO - FLANKS SUBJECT TO LAVA FLOWS AND OTHER KINDS OF VOLCANIC HAZARDS.

VALLEY FLOORS SUBJECT TO BURIAL BY HOT AVALANCHES OR SMALL- TO MODERATE-SIZED MUDFLOWS.

VALLEY FLOORS SUBJECT TO FLOODS AND RELATIVELY LARGE BUT INFREQUENT MUDFLOWS.



ASHFALL-HAZARD ZONE SUBJECT TO DEPOSITION OF 5 cm OR MORE DURING A MODERATE ERUPTION. MOST ASHFALL (75-80%) EXPECTED TO FALL IN AREA RANGING FROM NNE TO SSE OF VOLCANO.

SOURCE: Waldron 1989

Figure 2.15-1

Distribution of Ash

URS

Phase II Expansion
Satsop CT Project